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**STATUS OF CLAIMS:**

Claims 8-11 and 13-40 are pending herein, claims 1-7 and 12 having been cancelled without prejudice or disclaimer.

**REMARKS**

**A. Rejection of Claims 8-11, 13, 15-21 and 27-29 under 35 U.S.C. 103(a)**

Claims 8-11, 13, 15-21 and 27-29 are rejected under 35 U.S.C. 103(a) as unpatentable over Huang (U.S. Patent No. 6,171,940) and Hasegawa (U.S. Patent No. 6,452,274). Applicants respectfully traverse this rejection and its supporting remarks.

For example, in order to establish a *prima facie* case of obviousness under 35 U.S.C. 103, (a) there must be some suggestion or motivation to modify/combine the references of record, and (b) there must be a reasonable expectation of success. See MPEP §2143. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *Id.* The mere fact that references *can* be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination or modification. MPEP 2143.01 (emphasis added) (citing *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)).

Presently pending independent claims 8, 17, 27 and 30 each requires a mask structure that contains a CVD organic layer which comprises carbon and hydrogen. The CVD organic layer is deposited over a substrate structure by a plasma enhanced chemical vapor deposition process using a feed stream that comprises a hydrocarbon species.

Such a mask structure is neither disclosed nor suggested by Huang, which merely refers to an "organic material layer having low dielectric constant" which is used for a purpose "analogous to that of a hard mask." See, e.g., col. 1, lines 49-51.

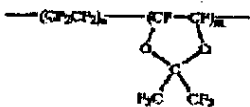
Recognizing this, the Office turns to Hasegawa, arguing that: "Hasegawa describes a method for forming an organic low dielectric layer by PECVD and using materials such as fluorinated ethylene propylene. This would form an organic layer comprising carbon and hydrogen....It would have been obvious for one skill in the art to form the organic low dielectric layer in light of Hasegawa because Hasegawa further teaches [a] method that is silent in Huang to form an organic low dielectric layer with a reasonable expectation of success."

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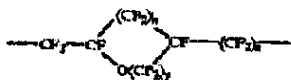
It is respectfully submitted, however, that the Office Action is attempting to turn a defect in Huang, specifically, its silence vis-à-vis the organic layer having low dielectric constant (e.g., its silence with respect to the composition of such an organic layer, its silence regarding how such an organic layer is formed, etc.), and in essence argues that this information vacuum constitutes motivation to use *any* organic layer having low dielectric constant, which is formed using *any* technique, for *any* purpose.

However, this is not the legal standard that is to be applied under 35 U.S.C. 103(a). Instead, "the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed." *In re Rouffet*, 149 F.3d 1350, 47 U.S.P.Q.2d 1453, 1458 (Fed. Cir. 1998). Such reasons have not been provided here.

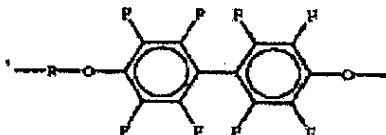
For example, the Office Action cites Hasegawa, because it describes a low dielectric layer (col. 3, line 20), which is preferably selected from an organic layer comprising: cyclic fluororesin, polytetrafluoroethylene, a *fluorinated ethylene propylene*, a copolymer of tetrafluoroethylene and perfluoroalkoxyethylene, polyfluorovinylidene, polytrifluorochloroethylene, a fluoroaryl ether resin, polyfluoroimide, benzocyclobutene (BCB) polymer, polyimide, amorphous carbon, a monomethyltrihydroxysilane (organic SOG) condensate, a polymer having a repeating structural unit in its molecule of:



, a polymer having a repeating structural unit in its molecule of



, a polymer having a repeating structural unit in its molecule of



, a polymer having a repeating structural unit in its molecule of



, and materials available commercially under the brand names Amorphous Teflon, CYTOP (phonetic), and Flare.

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The Office Action, however, does not explain why one of ordinary skill in the art would be motivated to select this particular material for use in Huang, as opposed to the myriad other low dielectric organic layers known in the art.

Indeed, it is noted that the dielectric layers in Hasegawa are not *masking* layers, which are used in processing a substrate structure and then removed, but rather are *interlayer insulting layers*, which are found within the multilayer interconnect structure of the finished device. See, e.g., Hasegawa Abstract and col. 1, lines 7-12. Because the layers of Huang and Hasegawa are employed in capacities that are completely unrelated to one another, it is respectfully submitted that one of ordinary skill in the art would be extremely unlikely to select the materials taught in Hasegawa for use in Huang, absent the hindsight gained from the present application.

In this regard, "the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed." *In re Rouffet*, 149 F.3d 1350, 47 U.S.P.Q.2d 1453, 1458 (Fed. Cir. 1998). Such reasons have not been provided here.

Nor does the Office Action explain why one would be motivated to use a plasma enhanced chemical vapor deposition process to form polymeric layers such as those containing fluorinated ethylene propylene, as opposed to other well known processes. In this connection, the Office Action refers to the portion of Hasegawa from col. 8, line 65, to col. 9, line 11. However, careful review of this portion of Hasegawa reveals that it teaches the formation of polymer layers, such as those containing fluorinated ethylene propylene, by spin coating techniques, rather than by PECVD.

In this regard, particularly with the aid of hindsight, it is noted that the art will frequently appear combinable or modifiable in a manner that will yield the claimed invention. However, this in and of itself will not make the resultant modification obvious. The art must still suggest the desirability of the modification. See *In re Gordon*, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984) ("The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification."). The Office Action fails to meet this burden.

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Moreover, one skilled in the art would not have had a reasonable expectation for success in using the "low dielectric layer" materials taught in Hasegawa as an "organic material layer having low dielectric constant" in Huang.

For example, the fact that a material may be useful as an interlayer insulating material within a multilayer interconnect structure would by no means provide a reasonable expectation that the same material can be successfully employed as a masking layer.

In essence, the Office is suggesting that it would be obvious to try to use one of the "low dielectric layer" interlayer insulating layers taught in Hasegawa et al. as an "organic material layer having low dielectric constant" masking layer as taught in Huang. However, permitting patentability determinations based on an "obvious to try" test "would not only be contrary to statute but result in marked deterioration of the entire patent system as an incentive to invest in those efforts and attempts which go by the name of 'research' " *In re Tomlinson*, 363 F.2d 928, 931, 150 U.S. P.Q. 623, 626 (CCPA 1966). In this connection, the CCPA has stated that "there is usually an element of 'obvious to try' in any research endeavor, that it is not undertaken with complete blindness but rather with some semblance of a chance of success." *Id.*

It is true that Applicants have been able to successfully employ a mask structure that contains a CVD organic layer comprising carbon and hydrogen, which is deposited by a plasma enhanced chemical vapor deposition process using a feed stream that comprises a hydrocarbon species. For instance, such layers have been shown to have the following characteristics: (a) they are conformal, allowing, for example, an extended etch of the layer after reaching the endpoint to be avoided (see paragraph [0036] of the present specification), (b) they are effective using fluorine-based chemistry (e.g., CF<sub>4</sub>-based chemistry), which is, for example, a relatively clean chemistry (*Id.*); they can be easily stripped in an oxygen-based plasma etching process (*Id.*); (d) they have a polycrystalline-silicon:CVD-organic selectivity that is greater than conventional dielectric hard masks, presently on the order of about 10:1 or greater, depending upon the etch recipe (*Id.* at paragraph [0035]); (e) they have k and n values which render them effective in combination with dielectric layers (e.g., a silicon oxynitride layer) (*Id.*); and (f) they can be readily etched using dielectric layers as masking layers (displaying, for example, a silicon-dioxide:CVD-organic selectivity of greater than about 100:1) (*Id.*). However, such successes cannot properly be used against the Applicant by the Office in establishing obviousness.

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For at least the above reasons, it is respectfully submitted that independent claims 8, 17, 27 and 30 are each unobvious in view of Huang and Hasegawa.

Claims 9-11, 13, 15, 16, 18-21, 28 and 29 depend, either directly or indirectly from independent claims 8, 17 and 27 and are therefore patentable over Huang and Hasegawa for at least the same reasons.

Accordingly, reconsideration and withdrawal of the rejection of claims 8-11, 13, 15-21 and 27-29 under 35 U.S.C. 103(a) as unpatentable over Huang and Hasegawa are respectfully requested.

**B. Rejection of Claims 22-24 under 35 U.S.C. 103(a)**

Claims 22-24 are rejected under 35 U.S.C. 103(a) as unpatentable over Huang and Hasegawa and further in view of Tsai (U.S. Patent No. 6,083,815). Applicants respectfully traverse this rejection and its supporting remarks.

As noted above claim 17 is patentable over Huang and Hasegawa, at least in that (a) there is no teaching, suggestion or motivation to use a "low dielectric layer" interlayer insulating layer as taught in Hasegawa et al. as an "organic material layer having low dielectric constant" masking layer as taught in Huang and (b) there would not be any expectation of success in doing so (e.g., the fact that a material may be useful as an interlayer insulating material within a multilayer interconnect structure would by no means provide a reasonable expectation that the same material can be successfully employed as a masking layer).

Tsai is cited by the Office Action for its alleged teachings regarding "etching a substrate to form a gate stack in which the doped polysilicon layer includes a native oxide and etching the native oxide and the doped polysilicon layer using 2 plasma etching processes that comprise halogen containing species to form a gate stack." These teachings, however, do not make up for the above noted deficiencies in Huang and Hasegawa. For at least these reasons, it is respectfully submitted that independent claim 17 is patentable over Huang and Hasegawa in view of Tsai.

Claims 22-24 depend indirectly from independent claim 17 and are therefore patentable over Huang and Hasegawa in view of Tsai for at least the same reasons.

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Accordingly, reconsideration and withdrawal of the rejection of claims 22-24 under 35 U.S.C. 103(a) as unpatentable over Huang and Hasegawa in view of Tsai are respectfully requested.

**C. Rejection of Claims 25 and 26 under 35 U.S.C. 103(a)**

Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as unpatentable over Huang and Hasegawa and further in view of Lou (U.S. Patent No. 6,200,881). Applicants respectfully traverse this rejection and its supporting remarks.

As noted above claim 17 is patentable over Huang and Hasegawa, at least in that (a) there is no teaching, suggestion or motivation to use a "low dielectric layer" interlayer insulating layer as taught in Hasegawa et al. as an "organic material layer having low dielectric constant" masking layer as taught in Huang and (b) there would not be any expectation of success in doing so

Lou is cited by the Office Action for its alleged teachings regarding "a method for etching a substrate which comprises a silicon layer, an oxide layer over the silicon layer, and a silicon nitride layer over the oxide layer, wherein the silicon, oxide and nitride layers are etched by one or more plasma etching steps comprising oxygen and halogen containing species." These teachings, however, do not make up for the above noted deficiencies in Huang and Hasegawa. For at least these reasons, it is respectfully submitted that independent claim 17 is patentable over Huang and Hasegawa in view of Lou.

Claims 25 and 26 depend, either directly or indirectly from independent claim 17 and are therefore patentable over Huang and Hasegawa in view of Lou for at least the same reasons.

Accordingly, reconsideration and withdrawal of the rejection of claims 25 and 26 under 35 U.S.C. 103(a) as unpatentable over Huang and Hasegawa in view of Lou are respectfully requested.

**D. Rejection of Claims 30, 31, 33 and 34 under 35 U.S.C. 103(a)**

Claims 30, 31, 33 and 34 are rejected under 35 U.S.C. 103(a) as unpatentable over Huang and Hasegawa and further in view of Chapman (U.S. Patent No. 5,976,769). Applicants respectfully traverse this rejection and its supporting remarks.

As noted above claim 30 is patentable over Huang and Hasegawa, at least in that (a) there is no teaching, suggestion or motivation to use a "low dielectric layer" interlayer insulating layer

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as taught in Hasegawa et al. as an "organic material layer having low dielectric constant" masking layer as taught in Huang and (b) there would not be any expectation of success in doing so.

Chapman is cited by the Office Action for its alleged teachings regarding "a method for providing sublithographic patterns wherein the exposed sidewalls of the organic layer are etched such that the width of the organic layer is reduced at the substrate using etching techniques including plasma etch." These teachings, however, do not make up for the above noted deficiencies in Huang and Hasegawa. For at least these reasons, it is respectfully submitted that independent claim 30 is patentable over Huang and Hasegawa in view of Chapman.

Claims 31, 33 and 34 depend, either directly or indirectly from independent claim 30 and are therefore patentable over Huang and Hasegawa in view of Chapman for at least the same reasons.

Accordingly, reconsideration and withdrawal of the rejection of claims 30, 31, 33 and 34 under 35 U.S.C. 103(a) as unpatentable over Huang and Hasegawa in view of Chapman are respectfully requested.

**E. Rejection of Claims 14, 32 and 35-40 under 35 U.S.C. 103(a)**

Claims 14, 32 and 35-40 are rejected under 35 U.S.C. 103(a) as unpatentable over Huang and Hasegawa, and further in view of Cheng (U.S. Patent No. 5,873,984) or as unpatentable over Huang, Hasegawa and Chapman, and further in view of Cheng. Applicants respectfully traverse these rejection and their supporting remarks.

For example, as noted above claims 8, 17, 27 and 30 are patentable over Huang, Hasegawa and Chapman, at least in that (a) there is no teaching, suggestion or motivation to use a "low dielectric layer" interlayer insulating layer as taught in Hasegawa et al. as an "organic material layer having low dielectric constant" masking layer as taught in Huang and (b) there would not be any expectation of success in doing so.

Cheng is cited by the Office Action for its alleged teachings regarding an amorphous carbon layer containing carbon, carbon and nitrogen. These teachings, however, do not make up for the above noted deficiencies in Huang, Hasegawa and Chapman. Indeed, Cheng further supports the assertion made above that the Office Action is using the information vacuum in Huang as motivation to use *any* organic layer having low dielectric constant, which is formed

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using *any* technique, for *any* purpose. For example, it is noted that Cheng describes the formation of an amorphous carbon overcoat *by sputtering* for use as a *protective film* on a *magnetic recording disk*. See, e.g. Title and Abstract. Hence, Cheng has nothing to do with masking layers as presently claimed.

For at least these reasons, it is respectfully submitted that independent claims 8, 17, 27 and 30 are patentable over Huang, Hasegawa and Chapman in view of Cheng.

Claims 14, 32 and 35-40 depend, either directly or indirectly from independent claim 8, 17, 27 or 30 and are therefore patentable over Huang, Hasegawa and Chapman in view of Cheng for at least the same reasons.

Accordingly, reconsideration and withdrawal of the rejection of claims 14, 32 and 35-40 under 35 U.S.C. 103(a) as unpatentable over Huang and Hasegawa in view of Cheng, or over Huang, Hasegawa and Chapman in view of Cheng, are respectfully requested.

#### **CONCLUSION**

Applicants submit that all pending claims of the present invention are in condition for allowance, early notification of which is earnestly solicited. Should the Examiner be of the view that an interview would expedite consideration of this Amendment or of the application at large, request is made that the Examiner telephone the Applicant's attorney at (703) 433-0510 in order that any outstanding issues be resolved.

#### **FEES**

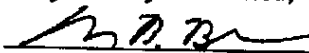
The Office is authorized to charge any fees due and owing in respect to this amendment to deposit account number 50-1047.



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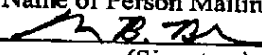
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